



SJTU **A**rtificial **I**ntelligence **S**pecial **I**nterest **G**roup*

Kick-off meeting

Yang Hua

May 2017

*AISIG [aizig3]: 爱致格

Outline

- The background of AISIG
- The procedure of AISIG incubation
- Practical guide for incubation stage 1
- Why and how to write (weekly) report

The background of AISIG

- Goals

- AISIG aims to incubate students to be qualified A.I. related researchers and engineers by regular group activities.
- AISIG targets at top-tier high-impact research outputs and tangible industrial-level prototypes/demos contributing to SJTU cloud team and QUB data science and scalable computing center.

- Directions

- Applied Machine Learning: Improve/Utilize Machine Learning on specific domain
- Computer Vision: Image/Video Understanding and Analysis by Deep Learning

The background of AISIG

- Staff members
 - Hosts and supervisors: Prof Guan and Prof Ma (SJTU)
 - Administrator and supervisor: Tao Song (SJTU)
 - Incubator and supervisor: Yang Hua (QUB)

The background of AISIG

- What we can do for you
 - Asset
 - A DELL R730 server with two K80 GPUs
 - High-end workstations
 - International research lab environment
 - World-class research projects
 - Immersive English environment for scientific research
 - Group activities
 - Regular group meeting
 - Book reading / paper reading
 - Online / offline discussion



The background of AISIG

- Student members

- <https://docs.google.com/spreadsheets/d/1dkPx5EpAgsFRJjUGwL4yAb95RtYesZIS9juzoj2vOt/w/edit#gid=0>

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The background of AISIG

- What we expect from you
 - Generally speaking, NOTHING special
 - Proactively participate in group activities and help/support other group members
 - Basic requirements for your graduation
 - Graduate students: publish several scientific papers
 - Undergraduate students: finish your final year project
 - Volunteer work
 - Maintain server
 - Maintain communication platform
 - Google group
 - Github
 - appear.in
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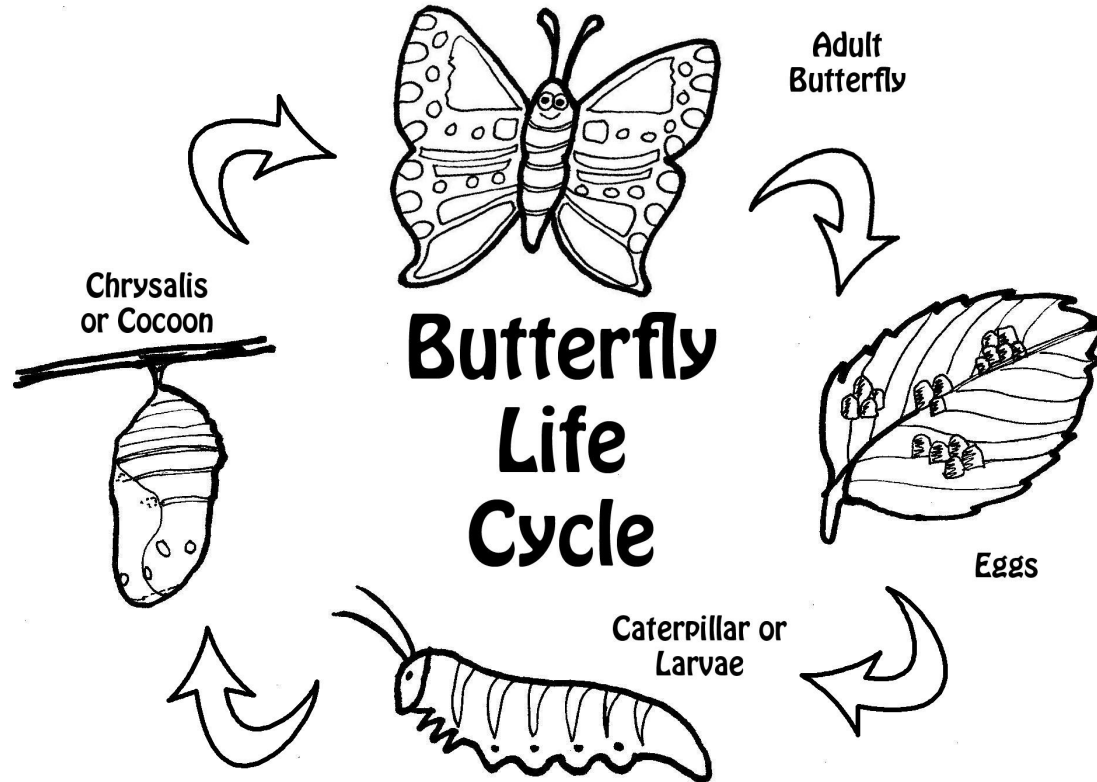
The background of AISIG

- Opportunity with AISIG
 - Become a qualified A.I. related researcher or engineer
 - Attend international conference
 - Visit QUB as an academic scholar
 - Intern at world-leading research companies or institutes
 -

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The procedure of AISIG incubation



Stage 0 (Egg) - Prerequisites

- Mathematics

- Calculus
- Linear Algebra
 - [course]: Linear Algebra - Foundations to Frontiers (<http://www.ulaff.net/>)
- Probability and Statistics
 - [course]: Introduction to Probability - The Science of Uncertainty (<https://www.edx.org/course/introduction-probability-science-mitx-6-041x-2>)

- Computer Science

- Basic programming skill (Python, Matlab, C/C++)
 - [book]: A Byte of Python (<https://python.swaroopch.com/>)
- Data structure and algorithm (optional, but highly request)
 - [course]: Algorithm (<https://www.coursera.org/specializations/algorithms>)

Stage 0 (Egg) - Prerequisites

- Skills

- Linux
- Git / github
 - [course]: How to Use Git and GitHub
(<https://www.udacity.com/course/how-to-use-git-and-github--ud775>)
- Latex
 - [book]: The Not So Short Introduction to LATEX2ε
(<https://gking.harvard.edu/files/lshort2.pdf>)
- Coding style
 - C/C++ (<https://google.github.io/styleguide/cppguide.html>)
 - Python (<https://google.github.io/styleguide/pyguide.html>)
 - Matlab
(<https://fr.mathworks.com/matlabcentral/fileexchange/46056-matlab-style-guidelines-2-0>)

Stage 1 (Caterpillar) - Intensive study

- Applied Machine Learning Direction

- Machine Learning
- Optimization
- Deep Learning
- Domain course

- Computer Vision Direction

- Digital Image/Video Processing
- Machine Learning
- Computer Vision
- Deep Learning

Stage 2 (Chrysalis) - Research/Final-Year project

- In the next talk: How to do (computer vision & machine learning) research

Stage 3 (Butterfly) - A qualified researcher / engineer

- What is a qualified researcher / engineer?
 - Successfully publish one peer-review scientific paper
 - Be able to propose a reasonable research direction by certain evidence (paper survey, mathematical formulation, or preliminary experimental results)
 - Quickly grasp key idea in the paper, implement it and find some points for improvement
- “With great power comes great responsibility”
 - Give tutorials or instructions to new “eggs”
 - Engage more research projects by helping and supporting other group members

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- **Practical guide for incubation stage 1**
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Practical guide for incubation stage 1: Study resource

- General courses

- Machine learning

- [course]: Machine Learning (<https://www.coursera.org/learn/machine-learning>)
 - [book]: Pattern Recognition and Machine Learning (<https://www.microsoft.com/en-us/research/people/cmbishop/>)

- Deep Learning

- [course]: Neural Networks for Machine Learning (<https://www.coursera.org/learn/neural-networks>)
 - [course]: Deep Learning Oxford (<https://www.youtube.com/watch?v=PlhFWT7vAEw&index=16&list=PLE6Wd9FR--EfW8dtjAuPoTuPcqmOV53Fu>)
 - [course]: CS231n: Convolutional Neural Networks for Visual Recognition (<http://cs231n.stanford.edu/>)
 - [online book]: (<http://neuralnetworksanddeeplearning.com/>)
 - [book]: Deep learning (<http://www.deeplearningbook.org/>)

Practical guide for incubation stage 1: Study resource

- Applied Machine Learning direction
 - Optimization
 - [course]: Convex Optimization (<https://lagunita.stanford.edu/courses/Engineering/CVX101/Winter2014/about>)
 - [course]: Discrete Optimization (<https://www.coursera.org/learn/discrete-optimization>)
- Computer Vision direction
 - Digital Image/Video Processing
 - [course]: Image and Video Processing: From Mars to Hollywood with a Stop at the Hospital (<https://www.coursera.org/learn/image-processing>)
 - Computer vision
 - [book]: Computer Vision: Algorithms and Applications (<http://szeliski.org/Book/>)

Practical guide for incubation stage 1: Tools & Libs

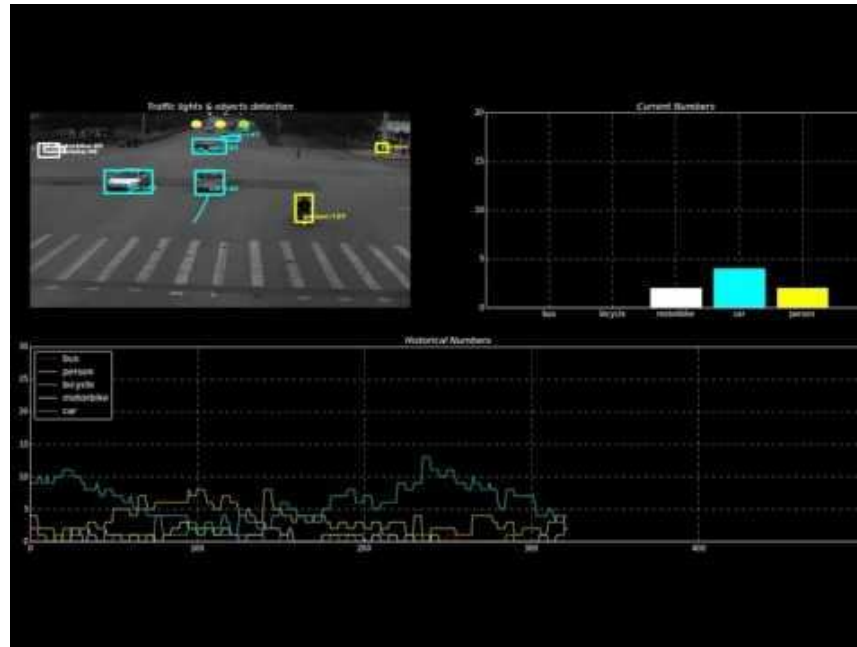
- Python
 - Numpy and scipy (<https://www.youtube.com/watch?v=gtejJ3RCddE>)
- Machine Learning
 - Scikit-learn (<http://scikit-learn.org/stable/tutorial/>)
- Image processing & Computer Vision
 - OpenCV
 - [book]: Learning OpenCV 3 (<http://shop.oreilly.com/product/0636920044765.do>)
 - Scikit-image (<http://scikit-image.org/>)
- Deep Learning
 - TensorFlow (https://www.tensorflow.org/get_started/)
 - Caffe (<http://caffe.berkeleyvision.org/tutorial/>)

Practical guide for incubation stage 1: Desired outputs

- Show off your certificates on google group
- Ask / answer questions related to study materials on google group
 - How To Ask Questions The Smart Way (<http://www.catb.org/esr/faqs/smart-questions.html>)
 - How to Be Amazingly Good at Asking Questions (<http://www.lifehack.org/articles/communication/how-amazingly-good-asking-questions.html>)
- Study report (please submit regularly)
- Study talks (We will organize a series of talks for the courses and book reading)

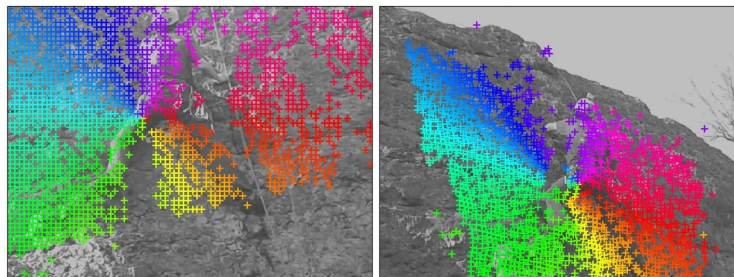
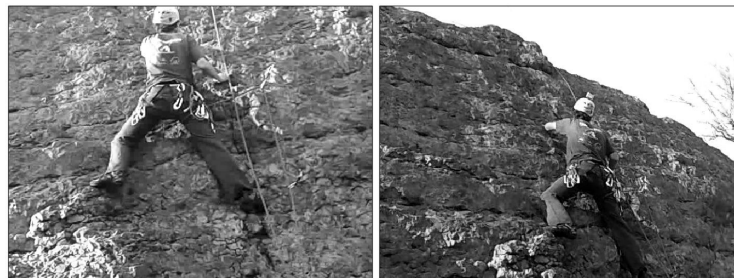
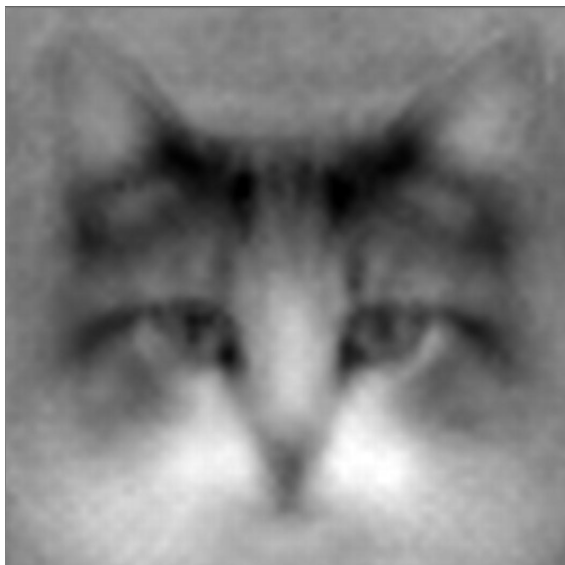
Practical guide for incubation stage 1: Project

- Computer Vision direction
 - Car detection / Recognition



Practical guide for incubation stage 1: Project

- Computer Vision direction
 - Key point alignment and image matching



Practical guide for incubation stage 1: Project

- Computer Vision direction
 - Real-time visual object tracker



Practical guide for incubation stage 1: Project

- Applied Machine Learning direction
 - Kaggle competition (<https://www.kaggle.com/competitions>)
- Propose your personal project
 - Motivation
 - Related work
 - Main methods
 - Outputs
 - Schedule

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Why we need to write (weekly) report

- Think about it in one minute
 - Log your personal progress
 - [Implicitly]: improve your English writing skill
- Requirement
 - Graduate student : need to write weekly report
 - Undergraduate students: bi-weekly, monthly report according to your own pace

How to write (weekly) report

- Format

- Use NIPS template (<https://nips.cc/Conferences/2015/PaperInformation/StyleFiles>) with Latex or Word
- Future: Markdown + Pandoc (I need one volunteer to help)

- Communication

- Send me email with report (pdf file) and CC to Prof Ma and Song Tao
- I will reply to you with comments as soon as I am free (Sorry, it may be several days delay sometime)
- Future: Centralize all your reports somewhere (Any idea?)

How to write (weekly) report

- Content

- Title, e.g., Weekly report (Apr 10, 2017 - Apr 23, 2017)
- Author
- Work done in this week
 - Some follow-up tasks from last report

>In conclusion, choosing an appropriate learning rate is necessary when training neural networks.

Couldn't agree more. Could you please summarize or find the evidence how to choose learning rate in term of experimental results?

How to write (weekly) report

- Content

- Work done in this week

- Something you have done/learned in this week

- Describe it in details one by one
 - Use table and figure to support your results and conclusion
 - If you solve some issues, write down how you did it

>The installation for MATLAB was pretty straightforward, but launching matlab R2016b from command line would throw an warning:

/usr/local/MATLAB/.../libstdc++.so.6: version 'GLIBCXX 3.4.21' not found.

Following the blog, we have to replace the libstdc++.so in

/usr/local/MATLAB/R2016b/sys/os/glnxa64/libstdc++.so.6 with /usr/lib/x86_64-linux-gnu/libstdc++.so.6

It is a common problem for Matlab. I don't think replacing library file directly is a good idea. Instead, probably starting matlab with 'LD_LIBRARY_PATH' system variable is a common strategy. Please refer to

<https://fr.mathworks.com/matlabcentral/answers/329796-issue-with-libstdc-so-6?requestedDomain=www.mathworks.com>

How to write (weekly) report

- Content
 - Work done in this week
 - Some existing issue or questions you have

>Questions

2. Except training huge weights takes plenty of time, what other problems make it hard to train deep neural networks?

Good question. There are many problems there: Some ones can be explained while more can not be explained. That's reason why many researchers don't like deep learning and consider it as "blackbox" technology. The main reason is that deep learning (deep neural network) is not a convex problem, i.e., based on current optimization methods, we can't not guarantee to find the best optimal result. Therefore, there are many so-called skills to help to train/tune your nets. My suggestion is try to train a full functional net with imageNET data (or partial data), then you can have better sense about this problem.

How to write (weekly) report

- Content
 - Plan for the next week
 - Try to make a manageable plan

>Next Week's Plan:

- 1. Move to the topic of convolutional neural networks.*
- 2. Get familiar with LeNet-5, GoogLeNet, AlexNet, VGG, ResNet.*
- 3. Know existing problem in current computer vision area through checking this website <https://github.com/kjw0612/awesome-deep-vision>.*

I don't fully support the plan. Probably it is too early to jump to these real world net. Try to understand some basic topics firstly. I recommend you to take two courses:

... ..

Thank you for your attention